FLUX VERSIONS AND ENERGIES
Manuel Buenfil, updated June 27, 2007

FLUXES (USED FOR MOVIES, NOT PARTICLE RELEASE)

NUMBERED FLUX VERSIONS ARE FOR AURORAL CAPS ONLY

Version 2
Read from CAPS file:

n = Density

$$\text{flux}[\text{cm}^{-2} s^{-1}] = 10^9 \left(\frac{n}{10}\right)^{2.2} + 7 * 10^7$$

Version 3
Read from CAPS file:

n = Density
S120 = Ponyting flux

$$\text{flux}[\text{cm}^{-2} s^{-1}] = 2.8 * 10^9 \left(\frac{n}{10}\right)^{2.2} + 5.6 * (0.245 * S120)^{1.26}$$

Version 10
Read from CAPS file:

n = Density
S120 = Ponyting flux
E=Characteristic Energy

$$T = \frac{\mathrm{E} \times 10^3}{7.0}$$

$$FLossCone = 0.4(1.0 + 0.8 \sin(2\pi(mlt - 3)/24))$$

$$N = n\left(1 - erf\left(\sqrt{\frac{50}{T}}\right)\right) \times FLossCone$$

$$\text{flux}[\text{cm}^{-2} s^{-1}] = \sqrt{2.8 \times 10^9 N^{2.2} 5.6 \times 10^7 (0.245 * S120)^{1.26}}$$

flux has a max of 3×10^9

Version 12
Read from CAPS file:

n = Density
S120 = Ponyting flux

Read from Steve's temperature file:

T=Temperature

$$FLossCone = 0.4(1.0 + 0.8\sin(2\pi(mlt - 3)/24))$$

$$N = n\left(1 - erf\left(\sqrt{\frac{50}{T}}\right)\right) \times FLossCone$$

$$\text{flux}[\text{cm}^{-2}s^{-1}] = \sqrt{2.8 \times 10^{9} N^{2.2} 5.6 \times 10^{7} \left(0.245 * S120\right)^{1.26}}$$

flux has a max of 3×10^{9}

FLUX FOR POLAR CAPS RELEASE

SZA=Solar Zenith Angle

If 0 < SZA < 90

$$\text{flux}[\text{cm}^{-2}\text{s}^{-1}] = 2 \times 10^{8}$$

If 90 < SZA < 110

$$\text{flux}[\text{cm}^{-2}\text{s}^{-1}] = 2 \times 10\text{^}\left(8 - 25 \times \frac{\text{SZA - 90}}{20}\right)$$

If SZA > 110

$$\text{flux}[\text{cm}^{-2}\text{s}^{-1}] = 2 \times 10^{5.5}$$

THERMAL AND PARALLEL ENERGIES
(USED FOR RELEASE, NOT MOVIES)

Read from CAPS file:

n = Density
S120 = Ponyting flux

TEMPERATURE from JOULE HEATING:

$$\mathrm{Eth(eV)} = 0.1 + 9.23(S120 \times 0.2452)^{0.35}$$

[$S120$ in mW/m^2 at 120km)]

$$\text{where } 0.245 = \frac{0.6829}{2.7854}$$

PARALLEL ENERGY from J// and KNIGHT:

$$\mathrm{E//[eV]} = \mathrm{Eth} + \mathrm{e\ Phi[V]}$$

$$\mathrm{Phi[V]} = 1500[\mathrm{V}/\mu\mathrm{A/m^2}] \times \left(\mathrm{J//} - 0.33\right)^2 [\mu\mathrm{A/m^2}] \text{ (0 if J// < 0.33)}$$

[Lyons, 1980, AGU Monograph 25]

For mapping up from 120 km to 1000 km altitude:

$$0.6829 = \left(\frac{6371 + 120}{6371 + 1000}\right)^3$$

For mapping down from 4000 to 1000 km altitude:

$$2.7854 = \left(\frac{6371 + 4000}{6371 + 1000}\right)^3$$